

**SYSTEMS AND METHODS FOR
MANUFACTURING REINFORCED,
THREE-ZONE MICROPOROUS
MEMBRANE**

ABSTRACT OF THE DISCLOSURE

25 Systems and methods for the manufacture of reinforced, three-
zone, microporous phase inversion membrane having any one of a plurality of
different possible pore sizes in any of the three zones from at least a single
30 mother dope batch is disclosed. The systems and methods include formulating
at least a single mother batch of dope in a vessel preferably maximizing the
non-solvent to solvent ratio for a given weight percentage of polymer for use
in a microporous phase inversion membrane production operation to produce
three-zone phase inversion membranes having one of a plurality of different
35 predetermined pore sizes in any or all of the three zones. The at least one
mother dope batch is controllably formulated in at least one vessel such that
the temperature of the dope does not exceed a predetermined maximum
mixing temperature and is maintained at a relatively low temperature (lower
than the mixing temperature) suitable for storage. A small portion of the dope
40 from the at least one mother batch is then heated to a temperature no higher
than any one of a plurality of target temperatures, in at least one thermal
manipulation apparatus, the target temperature corresponding to a specific
desired pore size to be formed in at least one zone of the microporous phase
inversion membrane that results from operations at a dope processing site.
45 The dope is then cooled to about room temperature or the temperature which
results in a suitable and/or optimal coating viscosity. At least one dope
application apparatus is connected to the at least one thermal manipulation
apparatus such that any one of a plurality of different pore size producing
dopes from the thermal manipulation apparatus is transported to the dope
50 processing site and applied to any one of the three-zones of the three-zone
reinforced, microporous membrane being produced.